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same, is also $\frac{40!}{36!.4!}=\frac{40.39.38.37}{1.2.3.4}$.

The number of committees in which the chairman is selected, leaving 39 from whom to choose, is $\frac{39!}{36!.3!}=\frac{39.38.37}{6}=9139$.

Also solved by *G. B. M. ZERR.*

151. Proposed by **JOHN M. COLAW, A. M.**, Monterey, Va.

Solve the equations:

$$\begin{aligned}
&x+y+z+u+w=1.\\
&ax+by+cz+du+ew=h,\\
&a^2x+b^2y+c^2z+d^2u+e^2w=h^2,\\
&a^3x+b^3y+c^3z+d^3u+e^3w=h^3,\\
&a^4x+b^4y+c^4z+d^4u+e^4w=h^4.
\end{aligned}$$

Solution by **CLARENCE E. COMSTOCK**, Professor of Mathematics. Bradley Polytechnic Institute. Peoria.Ill.

Solution by determinants.

$$x=\begin{vmatrix}1&1&1&1&1\\h&b&c&d&e\\h^2&b^2&c^2&d^2&e^2\\h^3&b^3&c^3&d^3&e^3\\h^4&b^4&c^4&d^4&e^4\end{vmatrix}\div\begin{vmatrix}1&1&1&1&1\\a&b&c&d&e\\a^2&b^2&c^2&d^2&e^2\\a^3&b^3&c^3&d^3&e^3\\a^4&b^4&c^4&d^4&e^4\end{vmatrix}\equiv\frac{\Delta_{a=b}}{\Delta}.$$

By the factor theorem, we get

$$\Delta=(a-b)(a-c)(a-d)(a-e)(b-c)(b-d)(b-e)(c-d)(c-e)(d-e).$$

$\Delta_{a=h}$=the same with a replaced by h.

$$\therefore x=\frac{(h-b)(h-c)(h-d)(h-e)}{(a-b)(a-c)(a-d)(a-e)}.$$

Since a, b, c, d, e appear in the same way, the principle of symmetry enables us to write the values y, z, u, w at once.

$$y=\frac{(h-a)(h-c)(h-d)(h-e)}{(b-a)(b-c)(b-d)(b-e)},\ z=\frac{(a-h)(c-h)(d-h)(e-h)}{(b-a)(c-a)(d-a)(e-a)},$$

$$u=\frac{(a-h)(b-h)(c-h)(e-h)}{(a-d)(b-d)(c-d)(e-d)},\text{ and } w=\frac{(a-h)(b-h)(c-h)(d-h)}{(a-e)(b-e)(c-e)(d-e)}$$

Solved in a similar manner by *G. B. M. ZERR.*

152. Proposed by **G. B. M. ZERR, A. M., Ph. D.**, Professor of Chemistry and Physics in The Temple College, Philadelphia, Pa.

Solve by a short original method, if possible:

$$x/a+y/b+c/z=P....(1),$$
$$x/a+b/y+z/z=Q....(2),$$
$$a/x+y/b+z/z=R....(3).$$

Solution by the PROPOSER.

Let $x/a=u$, $y/b=v$, $z/c=w$.

$u+v+1/w=P....(1)$, $u+1/v+w=Q....(2)$, $1/u+v+w=R....(3)$.

$(1)-(2)$ gives $v^2\mathrm{w}+v-vw^2-Pvw+Qvw=w....(4)$.

$(1)\times(3)$ gives $1=(P-v-1/w)(R-v-w)$, or

$$v^2w+v+vw^2-Pvw-Rvw=Pw^2-PRw+R....(5).$$

$(5)-(4)$ gives $vw=\dfrac{(w-R)(Pw-1)}{2w-R-Q}....(6)$.

$(5)\div(4)$ gives $\dfrac{vw+1+w^2-Pw-Rw}{vw+1-w^2-Pw+Qw}=\dfrac{Pw^2-PRw+R}{w}....(7)$.

(6) in (7) gives

$$\frac{2w^3-(P+Q+3R)w^2+(1+R^2+PQ+RQ)w-Q}{-2w^3+(R-P+3Q)w^2+(1-Q^2+PQ-RQ)w-Q}=\frac{Pw^2-PRw+R}{w}$$

$\therefore\ 2Pw^5+(2-3PR-3PQ+P^2)w^4+(4PQR+PR^2-P^2R+PQ^2-P^2Q-2P-Q-R)w^3+(1+2PQ-2QR+2PR-PQ^2R+P^2QR-PR^2Q)w^2+(RQ^2+R^2Q-R-Q-2PQR)w+RQ=0$.

This is an equation of the 5th degree and I have thus far been unable to solve it.

Let $P=Q=R$. Then

$$2Pw^5+(2-5P^2)w^4+4P(P^2-1)w^3+(1+2P^2-P^4)w^2-2Pw+P^2=0.$$

Let $P=3$.

$\therefore\ w^5-\frac{43}{6}w^4+16w^3-\frac{31}{3}w^2-w+\frac{3}{2}=0$, or $(w-\frac{1}{2})(w-1)(\mathrm{w}-3)(\mathrm{w}-3)(\mathrm{w}-\frac{1}{3})=0$.

$\therefore\ \mathrm{w}=\frac{1}{2}$, 1, 3, 3 or $-\frac{1}{3}$; $v=\frac{1}{2}$, 1, 3, $-\frac{1}{3}$ or 3; $u=\frac{1}{2}$, 1, $-\frac{1}{3}$, 3 or 3.

GEOMETRY.

176. Proposed by R. A. WELLS, Franklin College, New Athens, Ohio.

If there be three straight lines which meet in a point, and the arbitrary constants of their equations, expressed in the slope form, be taken as the co-ordinates of three points, these three points will lie in a straight line.